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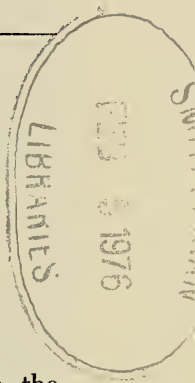
TWO NEW DIPLOPODS OF THE GENUS  
*POLYZONIUM* FROM NORTH CAROLINA,  
WITH RECORDS OF ESTABLISHED SPECIES  
(POLYZONIIDA: POLYZONIIDAE)

BY ROWLAND M. SHELLEY

North Carolina State Museum, P. O. Box 27647,  
Raleigh, North Carolina 27611

Millipeds of the genus *Polyzonium* are common in the litter fauna of eastern North America. The small, yellowish animals are easily recognized as *Polyzonium*, but until the recent summary by Loomis (1971), assignment to species had been on an indiscriminate basis. Loomis recognized eight species in North America, two of which, *P. bivirgatum* and *P. rosalbum*, have been reported from several North Carolina localities (Causey, 1940; Wray, 1967; Loomis, 1944, 1971). Unfortunately, these records are rather confused, especially for the piedmont, and in a few cases both names appear to have been assigned to the same material. In addition, the polyzoniid fauna of North Carolina is considerably more complex than previously thought, with at least two additional species, both undescribed, occurring in the state.

Reviewing the published North Carolina records in light of the criteria established by Loomis (1971), it becomes readily apparent that a number must be discounted until confirmed by fresh material. Some listings are based on representatives of the two new species, while others cannot be verified due to absence of the specimens. For all practical purposes, it is necessary to discard the previous North Carolina records of *Polyzonium* and start over. Furthermore, an additional barrier exists to resolution of this problem—the identity of *Buotus carolinus*, proposed by Chamberlin (1940) for an immature female polyzoniid from Duke Forest. The type



and only known specimen was deposited in the Chamberlin collection and is currently unavailable. The description is vague and unillustrated but suggests that the specimen might be of the genus *Polyzonium*. Establishing the specific identity of *B. carolinus* will be difficult because the type specimen lacks gonopods, but it may eventually be shown to be an undescribed species of *Polyzonium* in which the distal podomere\* of the anterior gonopods is straight and not apically curved. For this form, the dominant polyzoniid in the eastern piedmont, I propose the name *Polyzonium strictum*. If *B. carolinus* should prove to be this form, its specific name will have priority and that of the former will become a junior synonym. Description of this form has been deferred because of the *Buotus* situation, but a name must now be established for use in future studies on North Carolina diplopods.

A series of papers is eventually planned on the milliped genera of North Carolina. Many regions remain to be collected, however, and these studies are several years from completion. In view of the current confusion on *Polyzonium*, it seems that an interim report on the genus is desirable, in order to identify the species known from the state and to report authentic localities. This paper is submitted for that purpose. Descriptions and illustrations of the two new species are included along with figures of the anterior gonopods of *P. bivirgatum* and *P. rosalbum*. Individuals are most accurately identified by comparing the anterior gonopods of males with these drawings. Hopefully, this paper will clarify the status of North Carolina polyzoniids until a more thorough study can be prepared.

Lines of affinity in the genus *Polyzonium* are virtually impossible to determine due to our poor knowledge of most of the species. Loomis (1971) did not discuss relationships in his paper, which is the best available on the American forms. Thus, only very tentative conclusions can be drawn about the relationships of the two new species described herein. A real monograph of the genus, addressing problems of phylogeny, is clearly to be desired.

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\* The term "distal podomere" is used in this paper in the same sense as "seminal joint" by Loomis (1971).

I am grateful to H. F. Loomis for his valuable advice and to Richard L. Hoffman for the loan of his *Polyzonium* collection. Material from Hanging Rock, Morrow Mountain, and William B. Umstead State Parks was collected with permission of the North Carolina Department of Natural and Economic Resources, Division of State Parks. The specimens listed below are deposited in either the personal collection of Richard L. Hoffman (RLH) or the invertebrate collection of the North Carolina State Museum (NCSM).

***Polyzonium strictum*, new species**

Figures 1-4

*Type-specimens*: Male holotype (NCSM 1881) and 7 male and 6 female paratypes collected by the author, 25 July 1973, from Wilkes County, North Carolina, 4.4 miles NE McGrady, along county road 1730, 0.2 miles N junction county road 1728. Paratypes deposited in the U.S. National Museum; the Florida Collection of Arthropods, Gainesville; and the Zoologische Museum Amsterdam.

*Diagnosis*: Distal podomere of anterior gonopods apically straight, blunt, not curved mediad or laterad; sternal lobes low, moderately separated, base and tip subequal in width. Similar in size, general appearance, and sternal lobes of anterior gonopods to *P. rosalbum*, with which it may occur sympatrically (probably not syntopically), but differing in configuration of distal podomere of anterior gonopods and in much thinner first two legs.

*Holotype*: Length 9.5 mm, width 2.0 mm, 46 segments. Color yellowish, lighter on edges, posterior segments, and venter; dorsum with two rows of slightly darker, paramedian spots, one pair per segment, running entire length of specimen. Collum large, hood-like, completely covering ocelli and first two antennomeres. Sides of head slightly concave, meeting in front in angle of about 75°; antennae extending well beyond sides of body when held laterally; ocelli 3-3, equidistant, second ocelli larger than others, anterior interocular space subequal to diameter of ocellus, posterior interocular space 4-5 times as wide. Pores of segment 5 (Fig. 2) lower than those that follow, sides raised, interzonal stria only slightly bulging behind pores. Ultimate segment evenly rounded.

Anterior gonopods (Fig. 1) with sternal lobes short and broad, moderately separated; coxal lobe broad, slightly curved mediad at midlength but not apically, broad and rounded at tip; distal podomere slightly bulging at base, slightly curved mediad at midlength, but apex straight and blunt, not curved mediad or laterad. Legs 1 and 2 (Figs. 3, 4) smaller and thinner than succeeding ones, leg 3 slightly thickened. Sterna on legs 1 and 2 low and narrow, coxae almost touching; coxae of leg 3 more separated; sterna on other pregonopodal legs broad and low,

coxae well separated; sterna on postgonopodal legs low and narrow, coxae almost touching.

*Variation:* The male paratypes agree with the holotype but have fewer segments. The female paratypes are generally darker, with brown speckles on the anterior segments. The collum of the females appears smaller than that of the males, and all sterna of the females are low and narrow, with the coxae almost touching. On the other males, the size of the collum varies, and on some individuals it does not completely cover the ocelli. All mature individuals have three pairs of ocelli; one immature male from Durham Co. has two pairs. The gonopods are quite consistent, with the distal podomere always being straight, never apically curved. The size of the bulge at the base of the distal podomere varies in relation to the angle at which the distal podomere is directed. This structure is not always perpendicular but may lean slightly mediad or laterad, and those individuals in which the distal podomere leans laterad have a greater basal bulge.

*Ecology:* *Polyzonium strictum* is usually encountered in moist humus under or near rocks or logs in predominantly hardwood regions. It may occasionally be found under the bark of decaying pine logs.

*Distribution:* The species is known from Virginia and North Carolina, where it ranges from the mountains to the inner coastal plain. It has not yet been collected in Tennessee, South Carolina, or most of the coastal plain of North Carolina, but this absence is undoubtedly due to lack of investigations in these areas. Specimens have been examined as follows:

Virginia: Pulaski Co., Draper Mtn. above Pulaski, 1 ♂, 2 ♀, 4 October 1959, R. L. Hoffman and R. E. Crabill (RLH).

North Carolina: Madison Co., ravine along Southern railroad between Hot Springs and Paint Rock, 1 ♂, 2 August 1962, R. L. Hoffman (RLH). Ashe Co., 7.2 miles SE Jefferson, 1 ♂, 6 ♀, 21 June 1972, R. M. Shelley (NCSM 1200). Wilkes Co., 4.4 miles NE McGrady along co. rd. 1730, 0.2 miles N jct. co. rd. 1728, 8 ♂, 6 ♀, 25 July 1973, R. M. Shelley (NCSM 1881) TYPE LOCALITY; and 9 miles SE Wilkesboro, 2 ♂, 2 ♀, 26 July 1973, R. M. Shelley (NCSM 1827). Stokes Co., Hanging Rock State Park, 2 ♂, 4 ♀, 30 May 1973, R. M. Shelley (NCSM 1800). Stanly Co., 3 miles SE Albemarle, 4 ♂, 1 ♀, 19 October 1952, L. Hubricht (RLH); and Morrow Mtn. State Park, 1 ♂, 4 ♀, 9 August 1973, R. M. Shelley (NCSM 1901). Montgomery Co., 12 miles NW Troy, 2 ♂, 8 ♀, 19 July 1952, R. M. Shelley (NCSM 1175). Randolph Co., 7.2 miles NW Asheboro, 3 ♂, 15 juvs., 11 May 1972, R. M. Shelley (NCSM 1047). Caswell Co., 2.4 miles SE Yanceyville, 1 ♂, 23 May 1973, R. M. Shelley (NCSM 1779). Vance Co., 4.6 miles N Henderson, 1 ♂, 2 ♀, 25 August 1972, R. M. Shelley (NCSM 1500). Durham Co., 14.1 miles N Durham, 5 ♂, 12 ♀, 11 August 1972, R. M. Shelley (NCSM 1470). Orange Co., 1.5 miles SSW Hillsborough, 2 ♂, 2 ♀, 2 August 1973, R. M. Shelley (NCSM 1886). Wake Co., William B. Umstead State Park, 4 ♂, 9 ♀, 11 October 1971, R. M. Shelley (NCSM 2263);

and 4 miles SW Cary, Hemlock Bluffs, 2♂, 2♀, 17 June 1975, J. C. Clamp (NCSM A1) and 1♂, 4♀, 16 June 1975, J. C. Clamp (NCSM A2). Lee Co., 10 miles NE Sanford, 5♂, 10♀, 28 May 1974, R. M. Shelley (NCSM 1516). Moore Co., High Falls, 1♂, 28 August 1974, R. M. Shelley (NCSM 2501); and 8.6 miles W Carthage, 1♂, 2♀, 5 July 1974, R. M. Shelley (NCSM 2355). Cumberland Co., Fayetteville, 2♂, 2 juvs., 22 November 1948, D. L. Wray (RLH); and 2♂, 3♀, 24 October 1974, P. D. Kinser (NCSM 2774).

*Remarks:* *Polyzonium strictum* is the dominant polyzoniid diplopod in the eastern piedmont of North Carolina. It has been found sympatrically with *P. rosalbum* in Pulaski Co., Virginia, and Madison and Moore (High Falls) Cos., North Carolina, but the two species are probably not syntopic. In view of the morphological similarities between these two species, a close phylogenetic relationship is suspected.

Previous records of *Polyzonium* from piedmont North Carolina include *P. bivirgatum* from Durham (Loomis, 1944; Wray, 1967); Duke Forest (Wray, 1967); and Fayetteville, Cumberland Co. (Wray, 1967). *Polyzonium rosalbum* has been reported from Duke Forest (Causey, 1940); Fayetteville, Cumberland Co. (Loomis, 1971); and 3 miles SE Albemarle, Stanly Co. (Loomis, 1971). The Duke Forest and Fayetteville records appear to be examples in which both names were assigned to the same specimens. The Fayetteville and Stanly Co. specimens are actually *P. strictum* and not *P. bivirgatum* or *P. rosalbum*, as previously reported. The location of the Durham and Duke Forest specimens is unknown, and the records cannot be confirmed. In all likelihood they too refer to *P. strictum*, which is abundant in the "Triangle" (Raleigh-Durham-Chapel Hill) region. It is virtually certain that the record of *P. bivirgatum* from Durham (Loomis, 1944) is incorrect, as the species is authentically known in North Carolina from montane localities only. Except for the collection of *P. rosalbum* in High Falls, Moore Co., *P. strictum* is the only polyzoniid authentically known from the piedmont, and the other records are therefore discounted pending discovery of another individual.

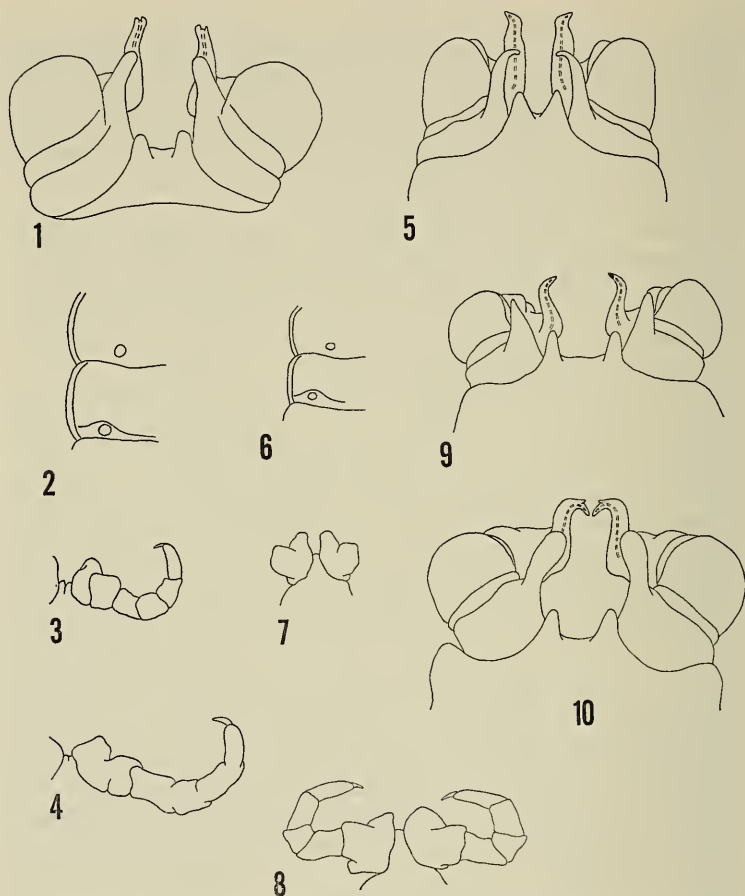
### *Polyzonium laterale*, new species

Figures 5-8

*Type-specimens:* Male holotype and one male and one female paratype collected by L. S. Knight, 18 October 1969, from Linville Gorge near Table Rock Mtn., in Burke Co., North Carolina (RLH).

*Diagnosis:* Distal podomere of anterior gonopods bent laterad apically, tip pointed; coxal lobe narrow, bent sharply mediad distally; sternal lobes high, broader at base than tip, narrowly separated.

*Holotype:* Length 8.2 mm, width 1.8 mm, 41 segments. Color uniformly light yellow dorsally and ventrally, becoming paler caudally. Collum large, hood-like, completely covering ocelli and first antennomeres. Head short and very broad, sides meeting in almost a right angle, apex blunt; antennae club shaped, distal segments thicker, nearly



FIGS. 1-4. *Polyzonium strictum* new species (holotype, NCSM 1881). 1, Anterior gonopods, anterior view; 2, Segments 5 and 6, lateral view; 3, Leg 1 and sternum, caudal view; 4, Leg 2 and sternum, anterior view. FIGS. 5-8. *Polyzonium laterale* new species (holotype, RLH). 5, Anterior gonopods, anterior view; 6, Segments 5 and 6, lateral view; 7, Sternum and basal joints of leg 1, caudal view; 8, Leg 2 and sternum, anterior view. FIG. 9. *Polyzonium bivirgatum* (Wood, 1864), specimen from Polk Co., North Carolina, 5 miles NE Saluda (NCSM 2036). Anterior gonopods, anterior view. FIG. 10. *Polyzonium rosalbum* (Cope, 1870), specimen from Madison Co., North Carolina, along U.S. hwy. 70, 0.8 miles W jct. N.C. hwy. 22 (RLH). Anterior gonopods, anterior view.

equalling sides of midbody segments when held laterally; ocelli 3-3, equidistant, first ocelli slightly larger than others, anterior interocular space subequal to diameter of ocellus, posterior interocular space 4-5 times as wide. Pores of segment 5 (Fig. 6) lower than those that follow, sides raised, interzonal stria only slightly bulging behind pores. Ultimate segment evenly rounded.

Anterior gonopods (Fig. 5) with sternal lobes high, subtriangular, wider at base than tip, bases almost contiguous; coxal lobe narrow, sharply bent mediad distally, sides gradually converging to narrow but rounded tip; distal podomere straight, bent sharply laterad apically, tip pointed. Legs 1 and 2 (Figs. 7, 8) crassate, leg 3 thinner. Sterna of legs 1 and 2 low and narrow, coxae almost touching; coxae of leg 3 more separated; sterna on other pregonopodal legs broad and low, coxae well separated; sterna on postgonopodal legs low and narrow, coxae almost touching.

*Variation:* The male paratype agrees essentially with the holotype, except that the head is more pointed, with its sides meeting in an angle of about 70°. The female paratype is much larger than either of the males (length 15 mm, width 2.3 mm, 58 segments) and has a slightly smaller collum and a pointed head (angle approximately 75°). All sterna of the female are low and narrow, with the coxae almost touching. The male from Tennessee differs considerably from those in the type series. It is brown along the caudal edge of the first 18 segments and the antennae are purplish (color pattern similar to that of *P. bivirgatum* (NCSM 2036)). The collum of the Tennessee male has a distinct reflected lip and does not completely cover the ocelli or first antennomeres; the head is broad but pointed (angle approximately 90°). On the gonopods, the coxal lobe bends less sharply distally, and the sternal lobes are more widely separated.

*Distribution:* The species is known only from the mountains of western North Carolina and extreme eastern Tennessee. Specimens have been examined as follows:

Tennessee: Carter Co., along U.S. Forest Service Rd., 4.5 miles N Shell Creek, 3500', 1♂, 17 July 1965, R. L. Hoffman and K. P. Brownell (RLH).

North Carolina: Burke Co., Linville Gorge near Table Rock Mtn., 2♂, 1♀, 18 October 1969, L. S. Knight (RLH) TYPE LOCALITY.

*Remarks:* *Polyzonium laterale* was previously reported from North Carolina as *P. bivirgatum* by Loomis (1971). It is unique in the configurations of the distal podomere and coxal lobe and does not appear to be closely related to any known species.

***Polyzonium bivirgatum* (Wood, 1864)**

Figure 9

*Octaglana bivirgata* Wood, 1864, *Proc. Acad. Natl. Sci. Phila.*, 16: 186.

*Polyzonium bivirgatum* Cook and Loomis, 1928, *Proc. U.S. Natl. Mus.*,

72: 18.—Chamberlin & Hoffman, 1958, *Bull. No. 212, U.S. Natl. Mus.*, p. 188.—Loomis, 1971, *Fla. Ent.*, 54: 155–156, figs. 6–10.

The first North Carolina record of *P. bivirgatum* was from Durham, in the piedmont (Loomis, 1944). It has since been reported from Durham; Duke Forest; and Fayetteville, Cumberland Co., by Wray (1967). The last record refers to *P. strictum*, as stated earlier, and the others probably do too. The material from Durham and Duke Forest is unavailable, however, and these records of *P. bivirgatum* are therefore discounted.

The species has also been reported from montane localities—Zionville, Watauga Co., (Wray, 1967); and Linville Gorge, Burke Co.; Madison Co. (two locations); and Mitchell Co. (Loomis, 1971). The Burke Co. record (Linville Gorge) is now assigned to *P. laterale*, as stated earlier; the Zionville material is unavailable for confirmation, although this is a plausible location for the species. Of the two Madison Co. records, one was based on a female, and I hesitate to report localities based solely on female specimens. The other, between Marshall and Hot Springs, was based on males and females unavailable to me but is also a plausible record for *P. bivirgatum*. Current evidence (from North Carolina and neighboring states) suggests that the species is restricted to montane localities in the state. The following are the two North Carolina localities which I know to be correct for *P. bivirgatum*:

Mitchell Co., Roan Mtn. below Carver's Gap, 5000' elevation, 12 ♂, 4 ♀, 23 September 1950, L. Hubricht (RLH). Polk Co., 5 miles NE Saluda, 2 ♂, 16 October 1973, R. M. Shelley (NCSM 2036).

### ***Polyzonium rosalbum* (Cope, 1870)**

Figure 10

*Petaserpes rosabus* Cope, 1870, *Trans. Amer. Ent. Soc.* 3: 65.—Bollmann, 1888, *Proc. U.S. Natl. Mus.*, 11: 343.

*Hexaglena cryptocephala* McNeill, 1887, *Proc. U.S. Natl. Mus.*, 10: 328.

*Polyzonium rosalbum* Williams and Hefner, 1928, *Bull. Ohio Biol. Surv.*, 18: 104, figs. 7–8.—Loomis, 1971, *Fla. Ent.*, 54: 161–162, figs. 30–34.

The original North Carolina record of this species was also from Durham (Causey 1940). Loomis (1971) reported it from Fayetteville, Cumberland Co.; 3 mi SE Albemarle, Stanly Co.; and four montane localities in Madison Co. The Fayetteville and Stanly Co. records both refer to *P. strictum*, as stated earlier, and the material from Durham is unavailable. In four years of collecting in the eastern piedmont, the only polyzoniid I have encountered around Durham is *P. strictum*. It is conceivable that Causey's specimens were actually *P. rosalbum*, since I have collected this species in Moore Co. (High Falls), only 50 miles SW Durham. Without the specimens, however, the record must be



deleted until new individuals are found. Current evidence indicates that *P. rosalbum* is widely distributed in the mountains and central piedmont of North Carolina. The following are North Carolina localities which I know to be correct for *P. rosalbum*:

Madison Co., along U.S. hwy. 70, 0.8 miles W jct. N.C. hwy. 22, 3 ♂, 23 July 1961, R. L. Hoffman (RLH); ravine at Paint Rock, 4 ♂, 2 ♀, 13 September 1952, L. Hubricht (RLH); Hot Springs, Silver Mine Recreation Area, 1 ♂, 2 August 1962, R. L. Hoffman (RLH); and ravine along Southern Railroad between Hot Springs and Paint Rock, 3 ♂, 3 ♀, 2 August 1962, R. L. Hoffman (RLH). Moore Co., south bank of Deep R. at High Falls, 2 ♂, 28 August 1974, R. M. Shelley (NCSM 2695).

#### ADDENDUM

As the paper was going to press, I received notice from Dr. Hoffman, who had just viewed the type of *Buotus carolinus*, that the milliped was not a polyzoniid but a chordeumid of the family Tingupidae, perhaps conspecific with the immature tingupids reported by Shear (1972) from Montgomery County, Virginia.

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